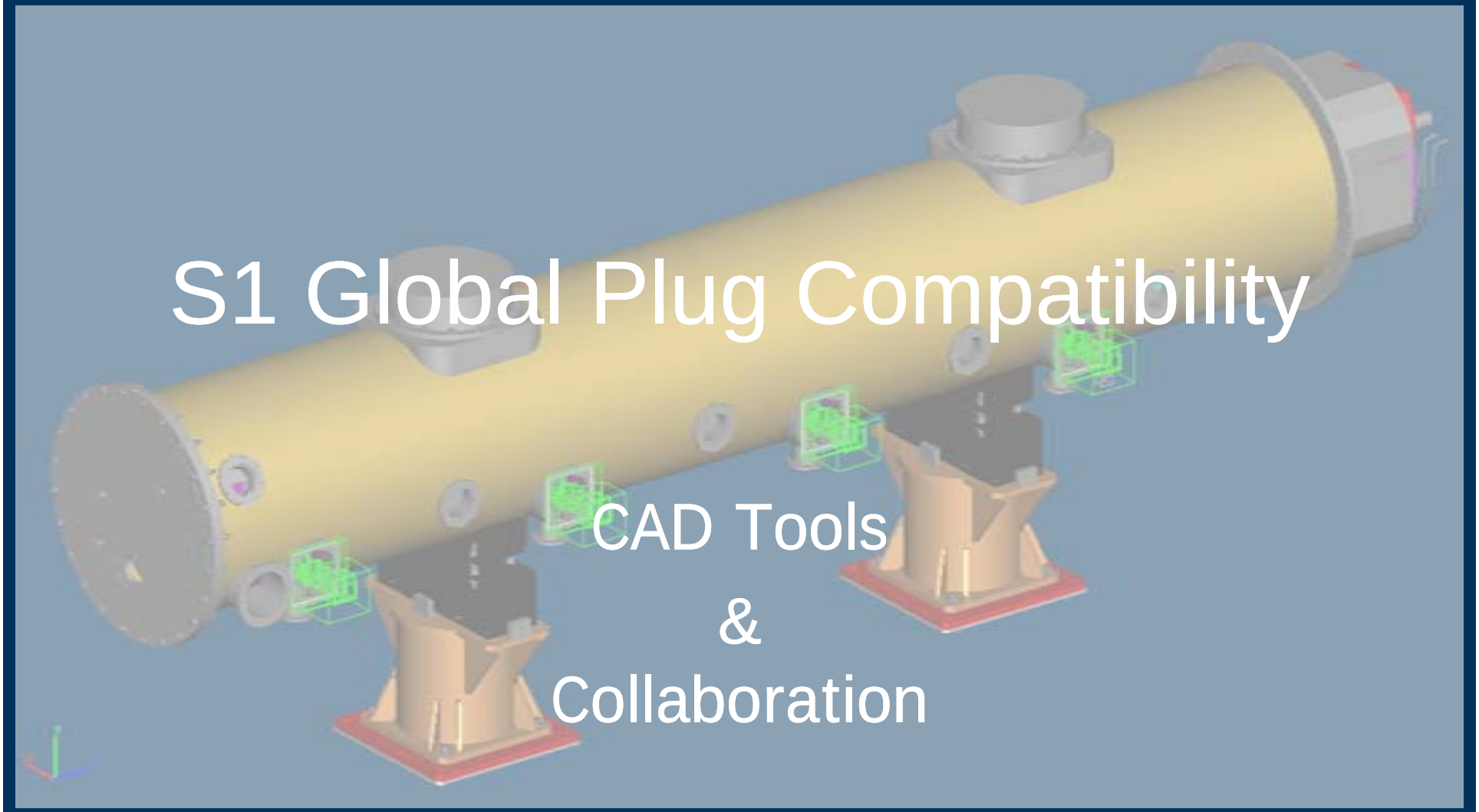


S1 Global Plug Compatibility

CAD Tools
&
Collaboration

April 23, 2008

Don Mitchell, FNAL

Agenda

- Design Overview
- Common CAD Tools
- The EDMS environment
- Sharing data and working together
  - The pros and cons
- Beyond the paper specifications
  - Neutral 3-D model
  - BOM's and design variants
- Plug Compatibility
  - 3 methods for collaboration
  - Global Cryomodule Design
- Conclusions

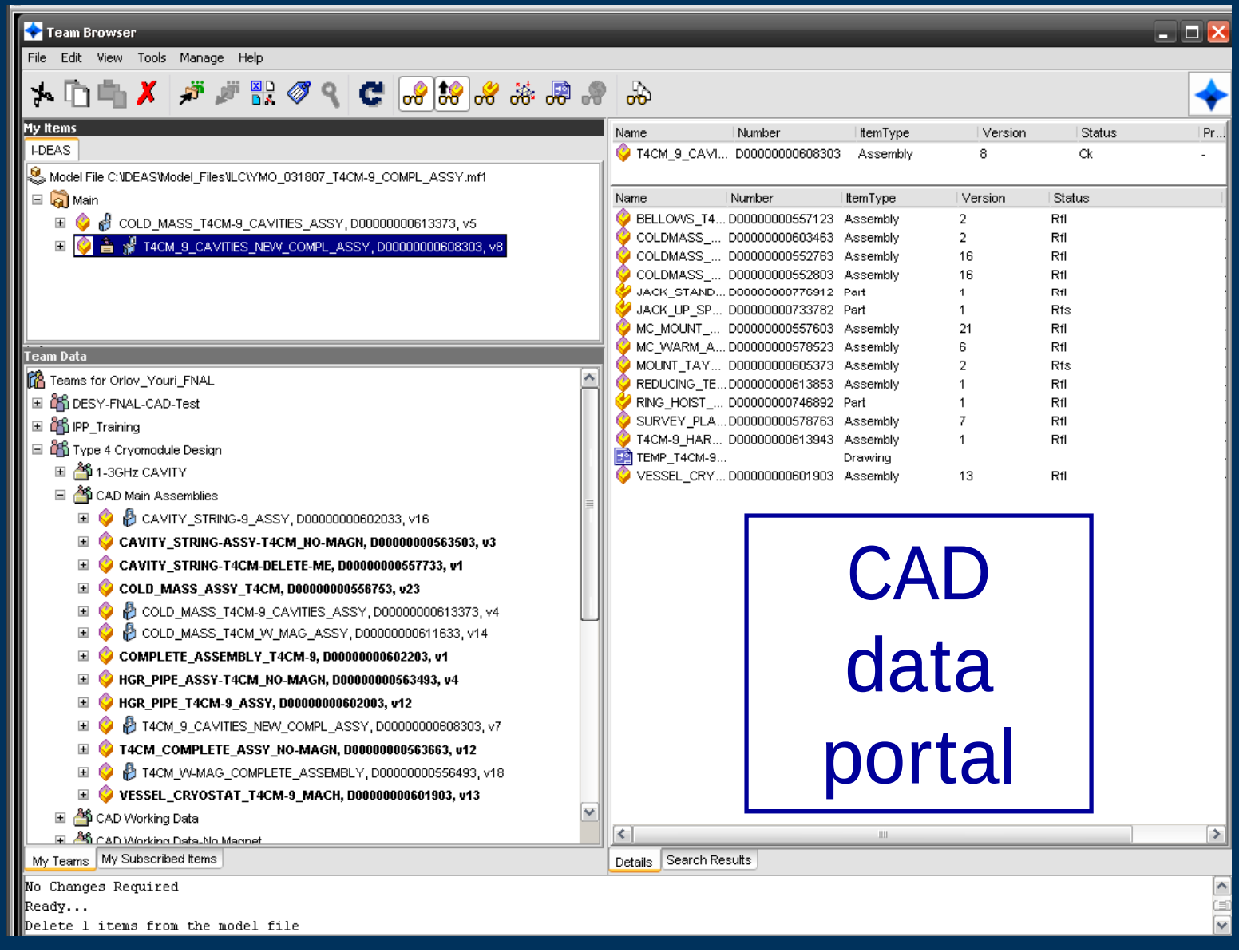
Common CAD tools

- FNAL: I-DEAS v.12
- SLAC: Solidedge
- JLAB: I-DEAS
- INFN Milan: UG-NX & I-DEAS v.12
- INFN Pisa: I-DEAS v.12
- KEK: One Space Design, I-DEAS v.12
- DESY: I-DEAS v.12

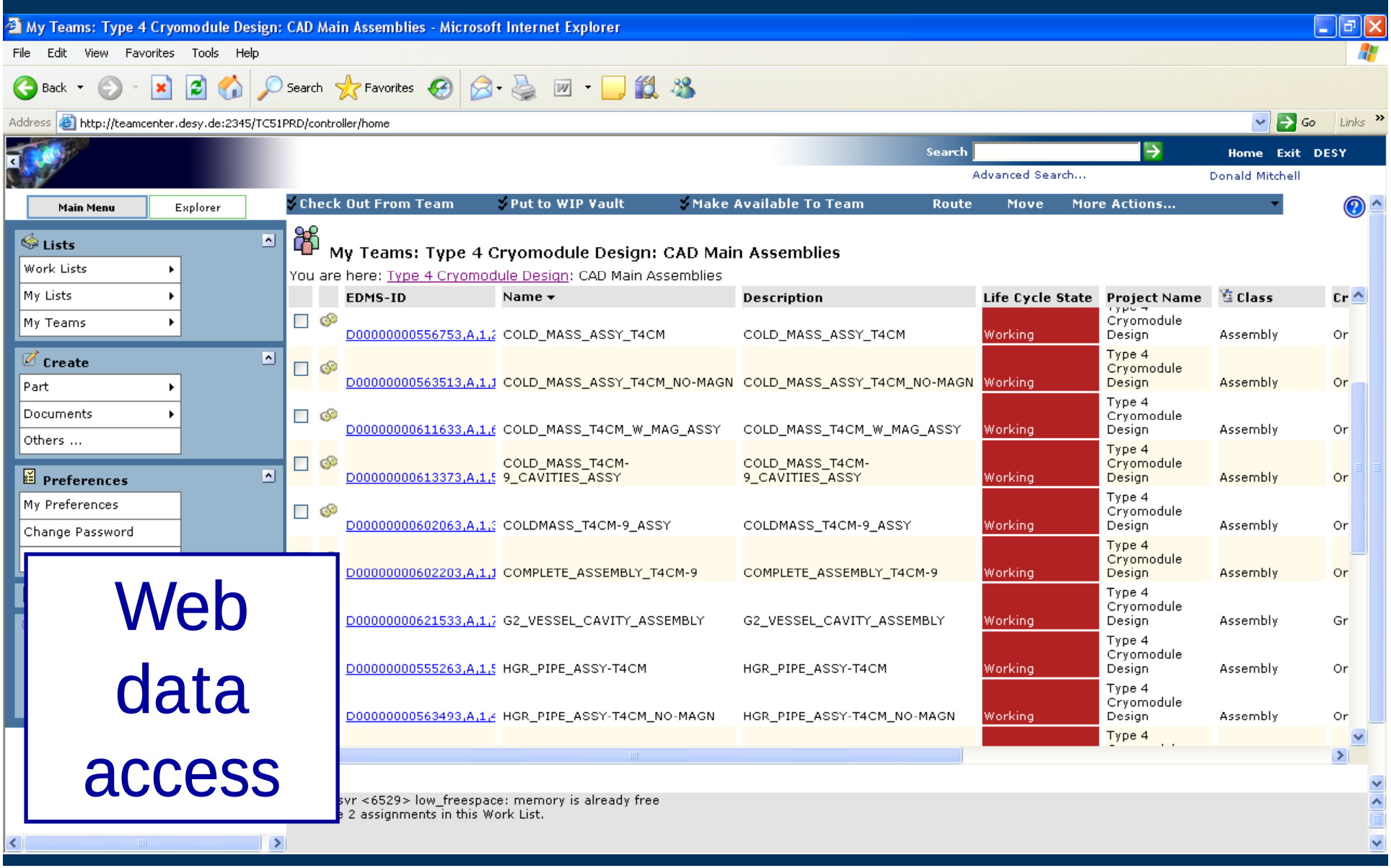
Common CAD Tools (in a perfect world)

- Common CAD software: I-DEAS v.12m4
  - DESY supported
- Common database: DESY EDMS
  - Live
  - Daily use
  - Integrated with global collaboration
  - Web viewable data and BOM structure
  - CAD and data file storage
    - 3-D, 2-D, specs, engineering notes, etc.
- Visualization and collaborative meetings
  - Teamcenter visualization software
  - EDMS Licenses supplied by DESY
  - On-line collaborative meetings with file sharing.
  - WebEx meetings with desktop sharing

Team Center Enterprise
EDMS Team Browser hosted by DESY



Team Center Enterprise
EDMS Thin-Client hosted by DESY



Web data access

Sharing Data and Working Together

- Documents:
  - Easily shared by all team members
  - Software independent
  - PDF files created automatically
  - Revision control is managed easily
- CAD data
  - Currently supports one CAD system: I-DEAS
  - Automatic creation of drawing viewing files
  - Automatic creation of 3-D viewing files
  - Revision control is managed easily

Sharing Data and Working Together

- Advantages:
  - Web-based control of documents; no need to send files around to team members
  - Live data: always up-to-date snapshot of design and parameters
  - 1 working model shared by entire team
- Disadvantages:
  - 1 CAD tool requires all players to migrate to one software package. Very challenging!
  - Training: Regional training and compliance to rules. Cost of setting up and maintaining a training program.

Design Collaboration (in the real world)

- Not likely that every lab will use the same CAD package
  - "live" data maintained at each institution
  - 2-D & 3-D visualization files must be shared
- DESY EDMS can and should be used.
  - Data maintained in EDMS
    - Project parameters
    - Engineering documents
    - Neutral CAD files (JT's, CGM's, PDF's)
  - Revision control in EDMS
  - BOM's (manually constructed or CAD related)
  - Variances in the design (alternate BOM's)

Real-Time Viewing of the Design

- Designs should be:
  - Current and up-to-date
  - Maintained in one system
  - Easily accessible
  - Show all design proposals
  - Maintained in a neutral format that anyone can view without the need of a CAD package
    - JT's for viewing solid models
    - CGM and PDF for viewing drawings
    - PDF for viewing documents

How do we get there?

- Initial EDMS organization:
  - Projects and teams
  - EDMS training
  - Upload Documents
  - Manual system level BOM construction
- Creation of CAD models and related to the system level BOM structure
- Master 3-D model maintained by a core team
  - Import, convert, or create neutral, JT CAD models
  - Combine the JT's into conceptual models
  - Maintain the master JT models in DESY's EDMS

Plug Compatibility
How do we collaborate?

- 3 Approaches for collaboration
  - 1. DESY Model
    - ALL users will use I-DEAS, ILC-EDMS
  - 2. One central model
    - Maintained in ILC-EDMS in I-DEAS
    - Collaborators use I-DEAS or supply STEP files that must be imported into I-DEAS and then uploaded into the EDMS
      - very labor intensive
      - Design is usually out-of-date
      - Data uploads always create new items in EDMS
        - No version control with STEP file imports
      - 2-D Drawings are not imported easily

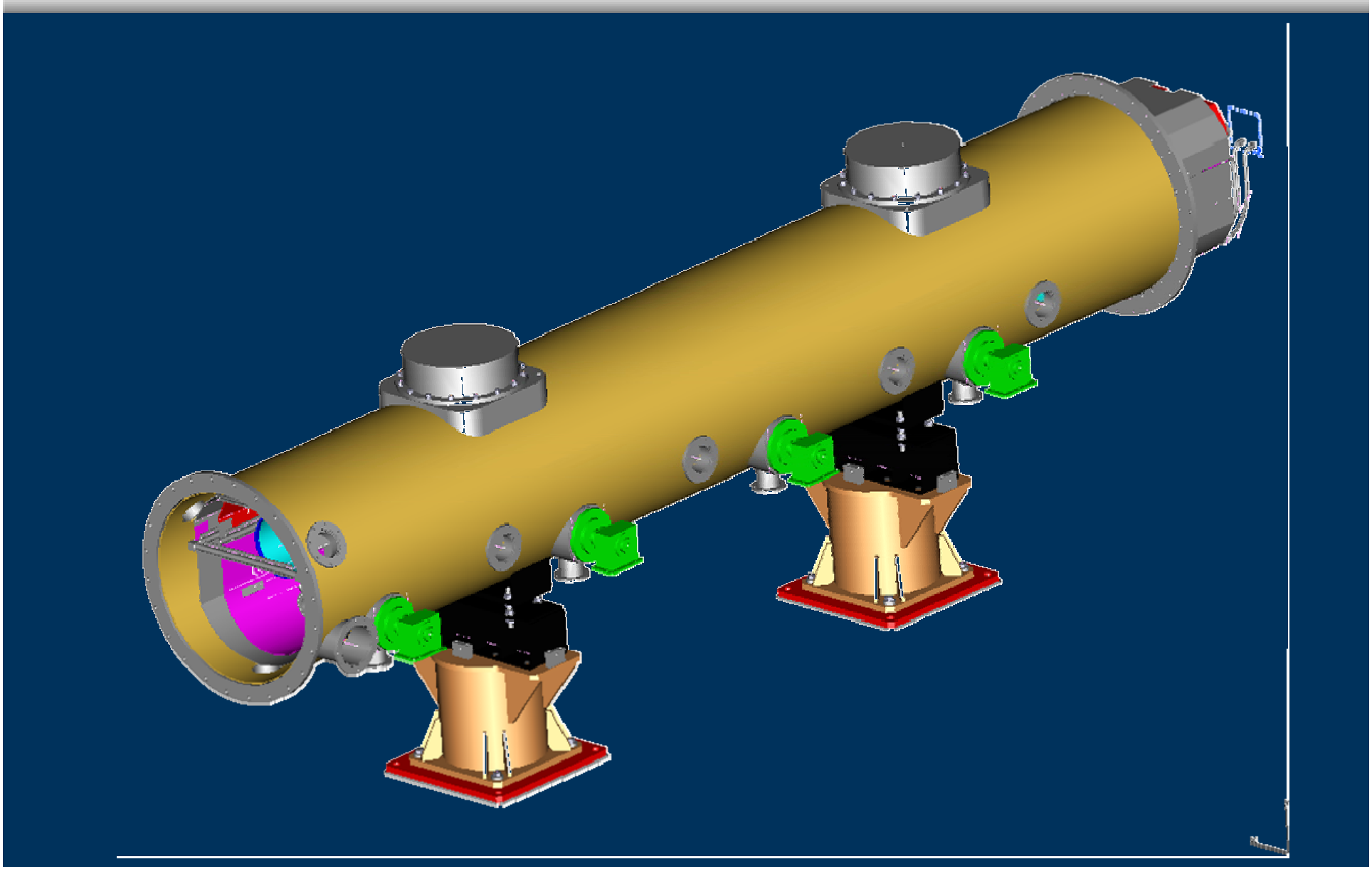
Plug Compatibility, cont.

- 3. JT neutral format
  - 3-D model maintained in I-DEAS & ILC-EDMS
  - Collaborators work in any CAD package but must be able to create their own JT files
  - Users upload their JT files into EDMS
    - JT files are *revision* controlled
      - Newer JT files become the next revision
      - new EDMS items are not created
      - EDMS numbers are retained
  - Master 3-D model maintained by 1 institution
    - JT files imported into the I-DEAS model or VisView Mockup
      - Automatic EDMS notification when newer JT file is available
    - Master JT model checked into EDMS
      - Complete master JT available via EDMS by all users
      - Downloadable through EDMS thin client (web)
      - 3-D only, does not include 2-D drawings

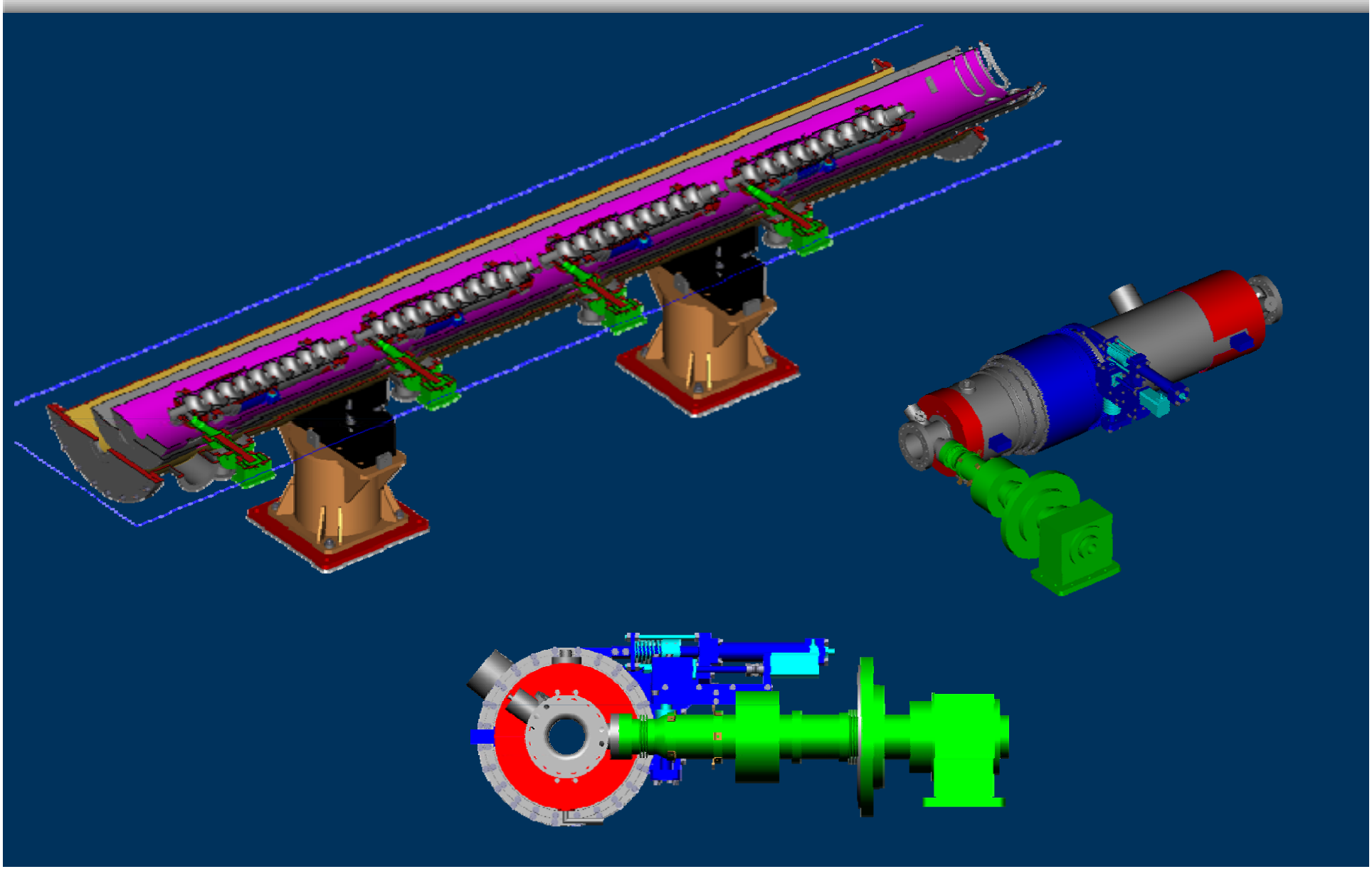
Plug-compatible CM design

- KEK STEP files were imported into I-DEAS
- JT files were created of the KEK designs
- In Vis-View Mockup, JT files were merged together. They included:
  - DESY dressed cavity
  - FNAL dressed cavity
  - KEK cryomodule and cavity
- KEK cavities were replaced with DESY and FNAL cavities
- An analysis of *form* and *fit* was performed
- *What if* scenarios can be explored

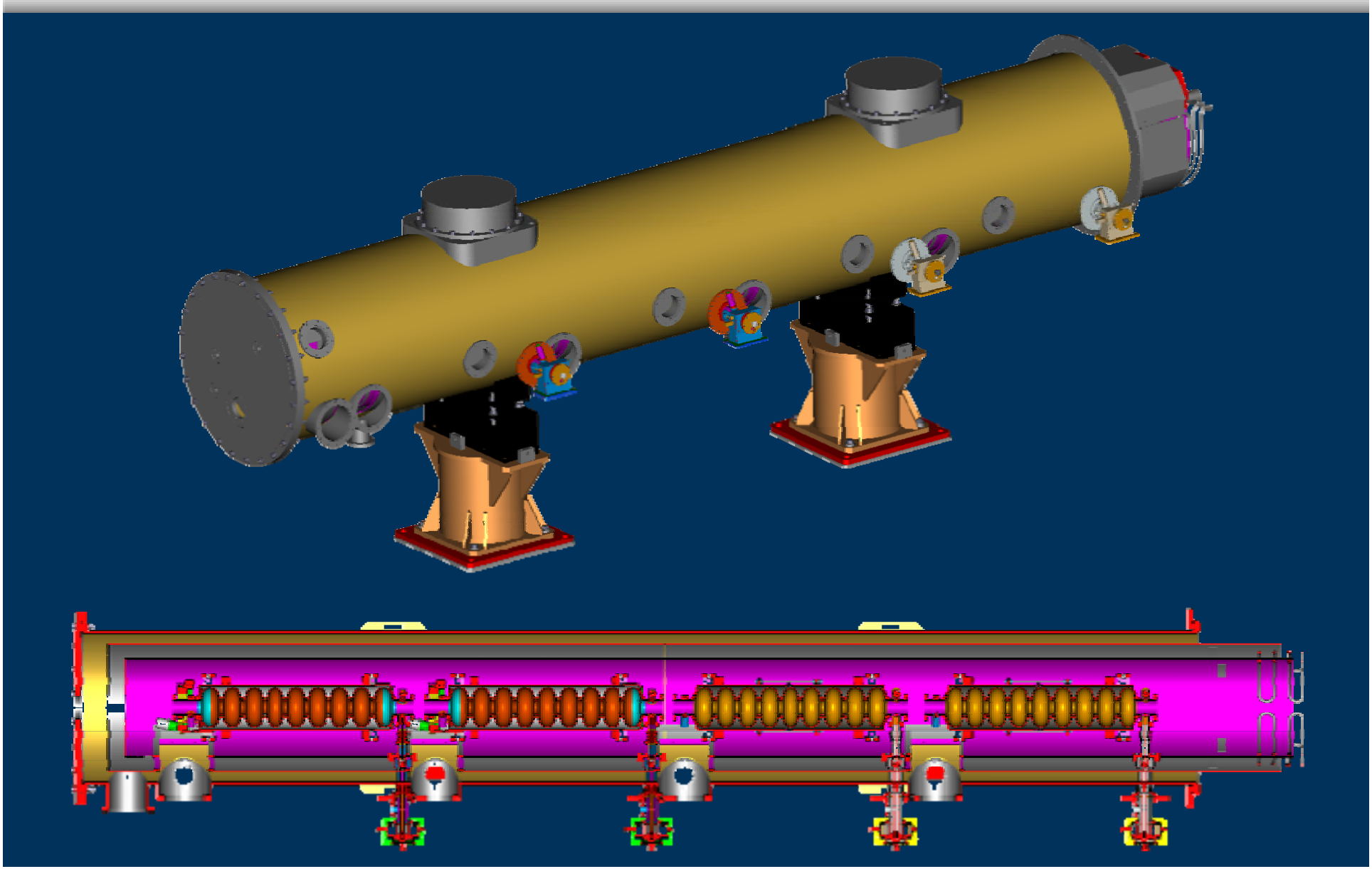
The KEK STF Model



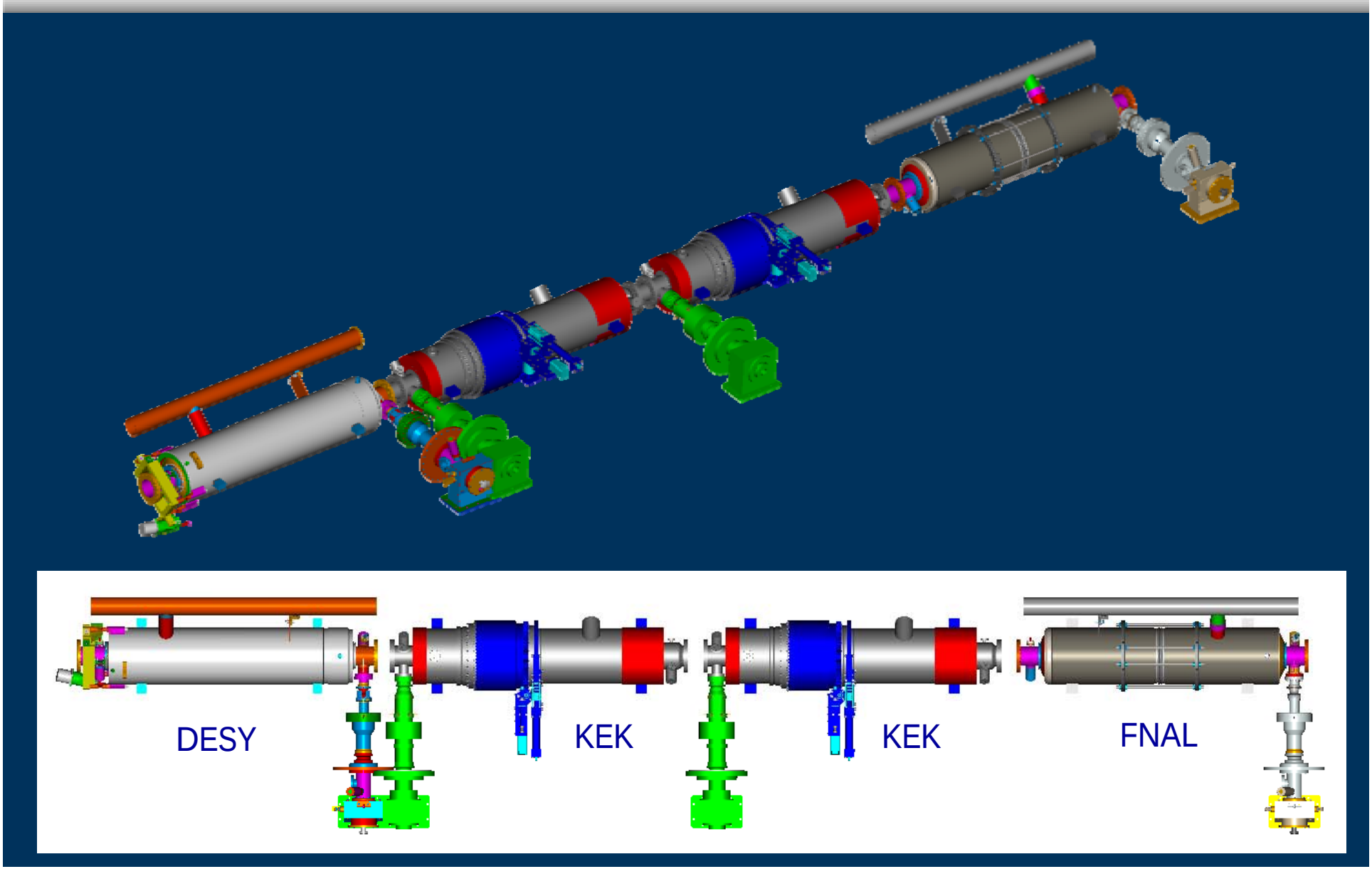
KEK Cryomodule Cross-section



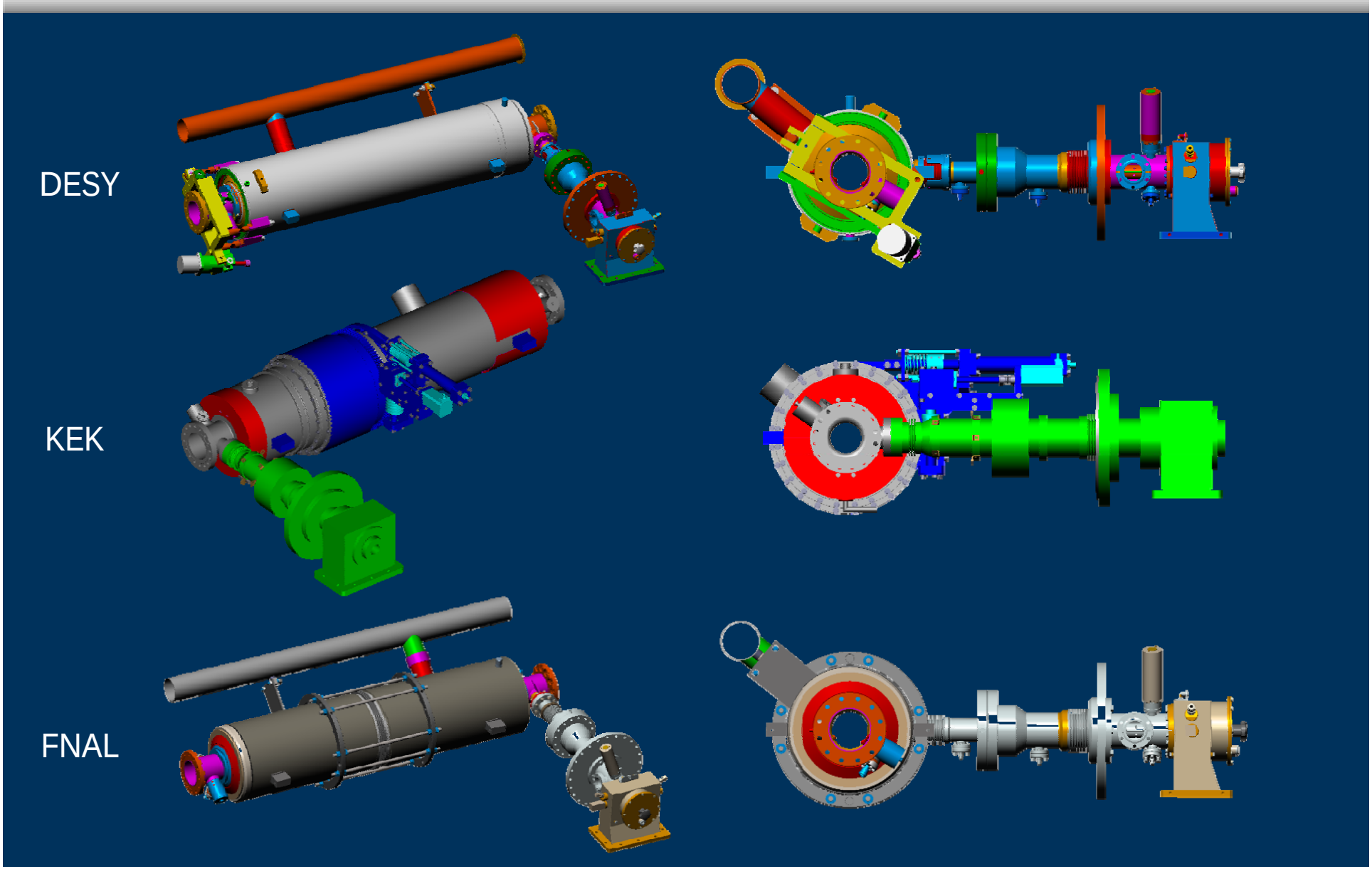
KEK Cryomodule with DESY and FNAL Cavities



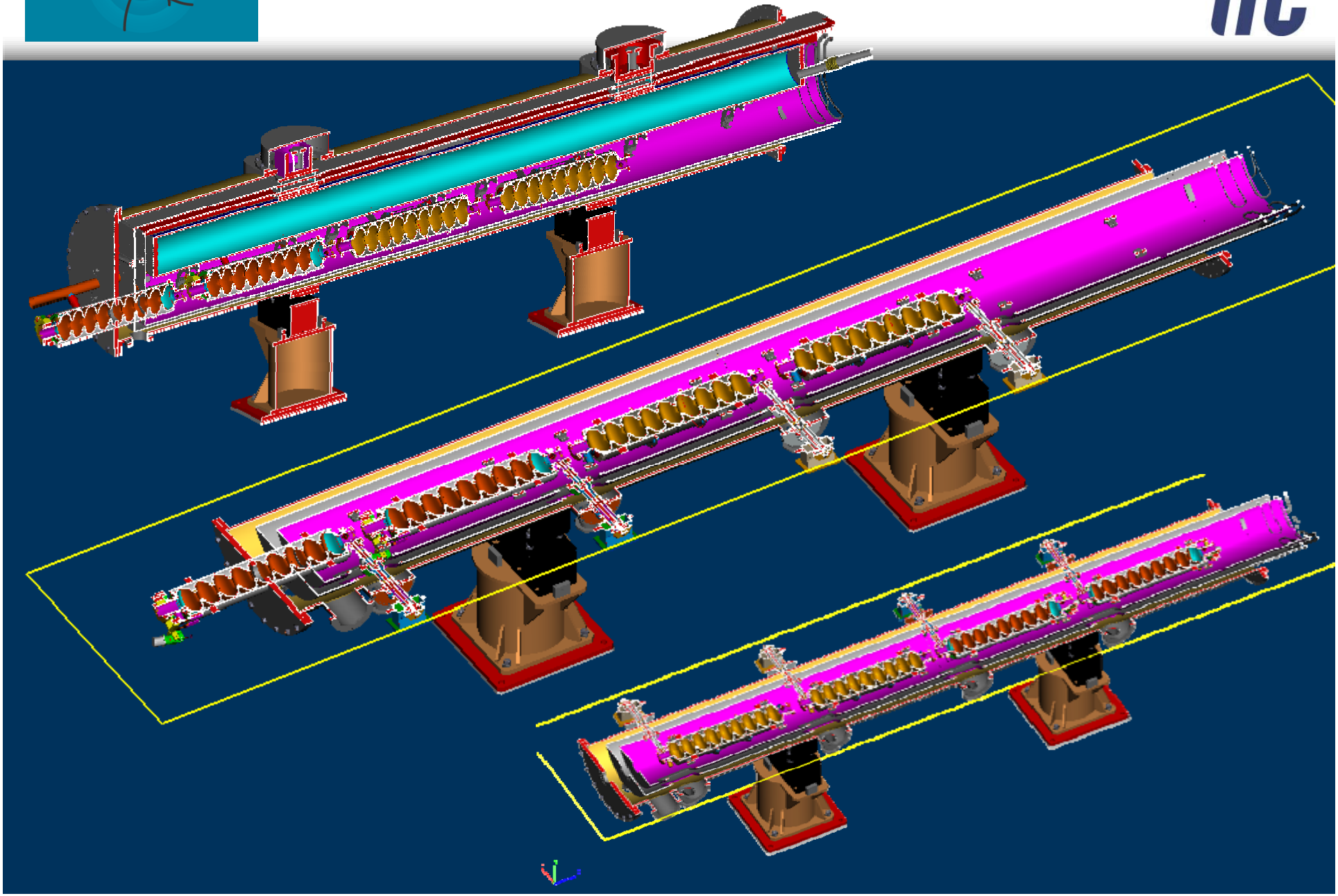
Combined Cavity-String for comparison



DESY / KEK / FNAL Cavities



Design Variants



Conclusion

- We need to decide which data management method will be implemented for design collaboration.
- A common coordinate system is needed.
- CAD rules need to be identified and followed.